*Callistemon suberosum*: Finally, and also growing under glass at present, is *C. suberosum* which has silver grey foliage which, in itself, makes this yet another plant from New Caledonia that we hope to try out further for its ability to acclimatize and grow under our garden conditions.

## PROPAGATION

A number of the species described were received as plants directly from the field in New Caledonia. They were potted in a John Innes potting compost and held under quarantine in the glasshouse for their first years.

Cuttings have been taken from *M. demonstrans* and *M. elegans*; indications are that they will readily root from semi-firm tip growths planted in sand with bottom heat. Most of the work of establishing these plants has been from seed collected in the field. Seeds of *Metrosideros* and *Xanthostemon* have germinated readily when sown in the glasshouse on pure fine grained vermiculite and watered with a made up nutrient solution until sufficiently well established for potting on. By this means also they have been kept free of any damping-off fungi.

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# RAPID PROPAGATION OF POPLARS BY TISSUE CULTURE METHODS


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**Abstract.** A rapid method for the propagation of poplars by tissue culture has been developed. In comparison with conventional practices very large numbers of rooted plants can be rapidly formed from small explants and the potting mix can be manipulated to give establishment advantages to the tree when planting out. The technique also gives a method for the international exchange of poplar material under sterile conditions, to eliminate the danger of disease introduction, in a form that can be quickly bulked up at any time of the year.


Because of the die-back and death of trees of many poplar cultivars in New Zealand due to the introduction of the rust

diseases *Melampsora laricini-populina* and *M. medusae*, large numbers of poplars planted for soil conservation purposes and timber must be replanted with cultivars resistant to these diseases. Large numbers of rust-resistant trees have been needed, therefore, to keep up with current planting programmes and replacement plantings. Many of these trees are newly-introduced disease-resistant or tolerant overseas cultivars, so there is likely to be a continuing need for large numbers of poplars of diverse origin for planting in many parts of New Zealand over the next few years.

Winton (1968) and Venverloo (1973) have shown that some species of poplar can be differentiated from callus cultures. The methods they describe do not offer a ready method for rapid propagation since the differentiation is slow and only limited numbers of shoots were formed on callus. This paper describes a method for the very rapid micropropagation of poplars by tissue culture.

## EXPERIMENTAL

Axillary buds of *Populus nigra* 'Italica', *P.* 'Flevo' (*P. deltoides* × *P. nigra*) and *P. yunnanensis* were taken from either leafed or dormant branches. The buds were surface sterilized by dipping them in ethanol and flaming them, and then submersion in a 0.2% hypochlorite solution followed by several washes in sterile water. The outer bracts were dissected from the buds which were placed on a modified Murashinge and Skoog medium (1962). (Table 1). The medium contained the growth substances for medium 1 (Table 1). Cultures were maintained at 25°C with a 16h photoperiod and a total radiant flux density of 20 $Wm^2$.

**Table 1.** Composition of medium used for rapid micropropagation of poplar species. Modified from Murashige and Skoog (1962). Weights in mg/l.

| | **Inorganic nutrients** | | **Organic supplements** | |
|---|---|---|---|---|
| $NH_4NO_3$ | 1650 $KNO_3$ | 1900 | nicotinic acid | 0.5 |
| $CaCl_2.2H_20$ | 440 $MgSO_27H_20$ | 370 | pyridoxin-HCl | 0.1 |
| $KH_2PO_4$ | 170 $H_3BO_3$ | 6.2 | thiamin-HCl | 0.1 |
| $MnSO_4.4H_20$ | 22.3 $ZnSO_4.4H_20$ | 8.6 | inositol | 100 |
| *KI* | *0.83* $Na_2Mo04_2H_20$ | 0.25 | lysine | 100 |
| $CuSO_4.5H_20$ | 0.025 $CoCl_2$ $6H_20$ | 0.025 | sucrose | 2000 |
| FeEDTA | 65.1 agar 1500 | | | |

| Growth substances | | |
|---|---|---|
| | Benzyl adenine | naphthaleneacetic acid |
| Medium 1 | 0.2 | 0 |
| Medium 2 | 0.1 | 0.02 |
| Medium 3 | 0.01 | 0.01 |

Bud break occurred within 2 to 3 weeks on medium 1, and within 4 weeks the axillary buds on the initial shoot had started to lengthen. The shoots were cut into 0.5 cm sections and re-

placed on medium 1. Adventitious bud formation and proliferation occurred on both cut and uncut surfaces, and existing axillary buds grew out. Once proliferation had started, tissue was transferred to medium 2 on which proliferation and growth continued for 6 to 8 weeks, after which time subculturing was necessary. Within this time 120 to 220 shoots had formed from each original bud explanted and some shoots had attained lengths of 6 to 8 cm. These shoots were then either rooted in pumice and peat or rooted under sterile conditions on medium 3 (Table 1). Root initiation under sterile conditions took place within 1 to 2 weeks. Alternatively these shoots could be cut into 0.5 cm sections and replaced on medium 1 to initiate another round of bud proliferation.

The results indicated that more than $10^6$ plantlets per year could be produced from one bud of any of the clones used. *P. yunnanensis* gave more shoots than the other two clones used, and *P. nigra* 'Italica' produced the least number of adventitious buds. The plantlets produced initially juvenile leaf shape, but after transplanting into pumice:peat the mature leaf shape became established. After rooting, the plants were transferred to polythene sleeves containing the growing mix. The plants received half-strength Hoagland's nutrient solution whilst growing in pumice and peat. Within 3 months the trees were 1 to 1½ m tall.

## DISCUSSION

The method of micropropagation described was rapid and gave large numbers of shoots from small explants of tissue. It has been shown to be effective with members of the genus *Populus*, section Aigeiros, and section Tacamahaca. Attempts are underway to see whether it can also be used to propagate members of the section Leuce. The method would be ideal for the rapid multiplication of new cultivars introduced from overseas since very large numbers can be quickly made available to Catchment Authorities and to those concerned with timber production. It has the further advantage that material can be exchanged internationally under sterile conditions reducing the risk of transmitting disease, yet maintaining the tissue in a state that allows rapid clonal propagation to begin immediately irrespective of the season.

The final product of propagation using this method is a rooted tree in growing medium. The method allows for the manipulation fo this growing medium to assist establishment in difficult areas. The height reached in a 3-month period after potting up, 1 to 1½ m, is ideal for the production of barbatelles. In this method the top is cut back to near ground level at planting and this allows for the establishment of a better root to

shoot balance. The method is commonly used in France and Italy and has been found to be extremely good in wind-prone areas, since the growth of the barbatelle *in situ* allows it to adapt to wind without the danger of wind throw.

Poplars for timber production are usually planted as 0/1 rooted cuttings, and equivalent specimens can be produced using the technique described here, provided a full season is available for growth prior to planting out. Production can be regulated so that rooted plantlets are potted up at the beginning of the growing season to ensure a supply of trees by the next winter.

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# THE PROPAGATION OF DECIDUOUS AZALEAS


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One of the most important aspects of propagating deciduous azaleas is the preparation of the mother stock. As time is the overiding factor, it is advisable to have stock plants containerized to ease handling.

During October, we move the stock plants into a glasshouse which has a day temperature of 18°C and a minimum of 15°C night temperature. Fluorescent lights are used to extend the day length to 11 hours. The stock can be re-potted just before being moved into the glasshouse but we have found that care should be taken not to damage the fibrous root system as this can cause collapse of the young shoots as they are forced into growth. Possibly the safest way to topdress the container is with a nitrogenous fertilizer, such as Uramite, 4 to 5 weeks before bringing them into the glasshouse. To further stimulate growth all flower buds should be removed without damaging the vegetative buds immediately below them.

The stock plants, held under the conditions described, show signs of vegetative growth in approximately one week.